Velocity of Money and Equation of Exchange

\[ M = \text{the money supply} \]
\[ P = \text{price level} \]
\[ Y = \text{aggregate output (income)} \]
\[ P \times Y = \text{aggregate nominal income (nominal GDP)} \]
\[ V = \text{velocity of money (average number of times per year that a dollar is spent)} \]

\[ V = \frac{P \times Y}{M} \]

Equation of Exchange
\[ M \times V = P \times Y \]
Quantity Theory

• Velocity fairly constant in short run
• Aggregate output at full-employment level
• Changes in money supply affect only the price level
• Movement in the price level results solely from change in the quantity of money
Quantity Theory of Money Demand

Divide both sides by $V$

$$M = \frac{1}{V} \times PY$$

When the money market is in equilibrium

$$M = M^d$$

Let $k = \frac{1}{V}$

$$M^d = k \times PY$$

Because $k$ is constant, the level of transactions generated by a fixed level of $PY$ determines the quantity of $M^d$

The demand for money is not affected by interest rates
FIGURE 1  Change in the Velocity of M1 and M2 from Year to Year, 1915–2005

Sources: Economic Report of the President; Banking and Monetary Statistics; www.federalreserve.gov/releases/h6/.
Keynes’s Liquidity Preference Theory

- Transactions Motive
- Precautionary Motive
- Speculative Motive
- Distinguishes between real and nominal quantities of money
The Three Motives

\[ \frac{M^d}{P} = f(i, Y) \]

where the demand for real money balances is negatively related to the interest rate \( i \), and positively related to real income \( Y \).

Rewriting

\[ \frac{P}{M^d} = \frac{1}{f(i,Y)} \]

Multiply both sides by \( Y \) and replacing \( M^d \) with \( M \)

\[ V = \frac{PY}{M} = \frac{Y}{f(i,Y)} \]
The Three Motives (cont’d)

The procyclical movement of interest rates should induce procyclical movements in velocity. Velocity will change as expectations about future normal levels of interest rates change.
There is an opportunity cost and benefit to holding money.

The transaction component of the demand for money is negatively related to the level of interest rates.
Precautionary Demand

• Similar to transactions demand

• As interest rates rise, the opportunity cost of holding precautionary balances rises

• The precautionary demand for money is negatively related to interest rates
Speculative Demand

- Implication of no diversification
- Only partial explanations developed further
  - Risk averse people will diversify
  - Did not explain why money is held as a store of wealth
Friedman’s
Modern Quantity Theory of Money

\[
\frac{M^d}{P} = f(Y_p, r_b - r_m, r_e - r_m, \pi^e - r_m)
\]

\[
\frac{M^d}{P} \text{ = demand for real money balances}
\]

\[
Y_p \text{ = measure of wealth (permanent income)}
\]

\[
r_m \text{ = expected return on money}
\]

\[
r_b \text{ = expected return on bonds}
\]

\[
r_e \text{ = expected return on equity}
\]

\[
\pi^e \text{ = expected inflation rate}
\]
Variables in the Money Demand Function

- Permanent income (average long-run income) is stable, the demand for money will not fluctuate much with business cycle movements.

- Wealth can be held in bonds, equity and goods; incentives for holding these are represented by the expected return on each of these assets relative to the expected return on money.

- The expected return on money is influenced by:
  - The services proved by banks on deposits
  - The interest payment on money balances
Differences between Keynes’s and Friedman’s Model

- Friedman
  - Includes alternative assets to money
  - Viewed money and goods as substitutes
  - The expected return on money is not constant; however, $r_b - r_m$ does stay constant as interest rates rise
  - Interest rates have little effect on the demand for money
Differences between Keynes’s and Friedman’s Model (cont’d)

• Friedman (cont’d)
  ✷ The demand for money is stable ⇒ velocity is predictable
  ✷ Money is the primary determinant of aggregate spending
Empirical Evidence

• Interest rates and money demand
  ♦ Consistent evidence of the interest sensitivity of the demand for money
  ♦ Little evidence of liquidity trap

• Stability of money demand
  ♦ Prior to 1970, evidence strongly supported stability of the money demand function
  ♦ Since 1973, instability of the money demand function has caused velocity to be harder to predict

• Implications for how monetary policy should be conducted